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CAF URBAN SEARCH AND RESCUE CAPABILITY

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CAF URBAN SEARCH AND RESCUE CAPABILITY

AIM

1. The aim of this service paper is to highlight the requirement for a more robust urban search and rescue (USAR) capability and propose how this should be developed.

INTRODUCTION

2. Urbanization is a common trend found in multiple studies attempting to define the future security environment. The world's population is expected to reach eight billion by the year 2030. Currently approximately 3.6 billion people live in urban centers. This is expected to rise to five billion by 2030 meaning 60% of the world's population will be concentrated in urban centers. The majority of urbanization is predicted to occur in areas bordering the ocean.[1] The Intergovernmental Panel on Climate Change (IPCC) warns that climate change trends are highly likely to have an impact throughout the world as water levels rise including increased strength and frequency of tropical storms and natural disasters.[2] These effects will be compounded by the increasing number of people migrating to urban littoral areas.

3. As the percentage of our population living in urban centers increases, so does the likelihood of having to conduct military operations in an urban environment. In its 2014 Future Land Warfare Report, the Australian Army determined that "for the army, operating in high density urban terrain will no longer be a discretionary activity."[3] If the Canadian Armed Forces (CAF) will be asked to conduct combat operations within urban areas in the future, an integral urban search and rescue (USAR) capability would provide an essential shield function to protect

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[1]Modernisation and Strategic Planning Division, *Future Land Warfare Report* (Canberra: Australian Army Headquarters, 2014), 7.

[2]Chief of Force Development, *The Future Security Environment 2013-2030* (Winnipeg: 17 Wing Winnipeg Publishing Office, 2014), 44.

[3]Modernisation and Strategic Planning Division, *Future Land…, 9.*

the force. A USAR capability would provide the Government of Canada (GOC) with an additional asset to contribute to disaster response both domestically to complement civilian USAR capabilities and as an expeditionary asset as part of the Disaster Assistance and Response Team (DART).

DISCUSSION

4. In Canada, like in most developed nations, Search and Rescue (SAR) is a joint civilian-military effort. SAR is a shared responsibility among federal, provincial/territorial and municipal organizations as well as volunteer organizations. The Canadian Armed Forces' (CAF) primary responsibility is the provision of aeronautical SAR and the coordination of the aeronautical and maritime SAR system.[4] The Canadian Coast Guard is responsible for marine incidents, Parks Canada is responsible within national parks and provincial and territorial governments are responsible for ground search and rescue (GSAR). Despite the varying jurisdictions, the National SAR Program under Public Safety Canada works to achieve integration, interoperability and coordination amongst the various government levels, the military and volunteer organizations.[5]

5. The requirement for domestic urban search and rescue (USAR) capabilities were highlighted by the 9-11 attacks. Since 2001, Public Safety Canada has had the lead on the development of light, medium and heavy USAR capabilities. Public Safety defines USAR as "a general term for a group of specialized rescue skills that are integrated into a team with resources that include search, medical and structural assessment capacity."[6] USAR involves the location, extrication and initial stabilization of people trapped in a confined space or under debris due to a

[4]National Defence and the Canadian Armed Forces, "Search and Rescue," last accessed 07 February 2016, http://www.forces.gc.ca/en/operations-canada-north-america-current/sar-canada.page

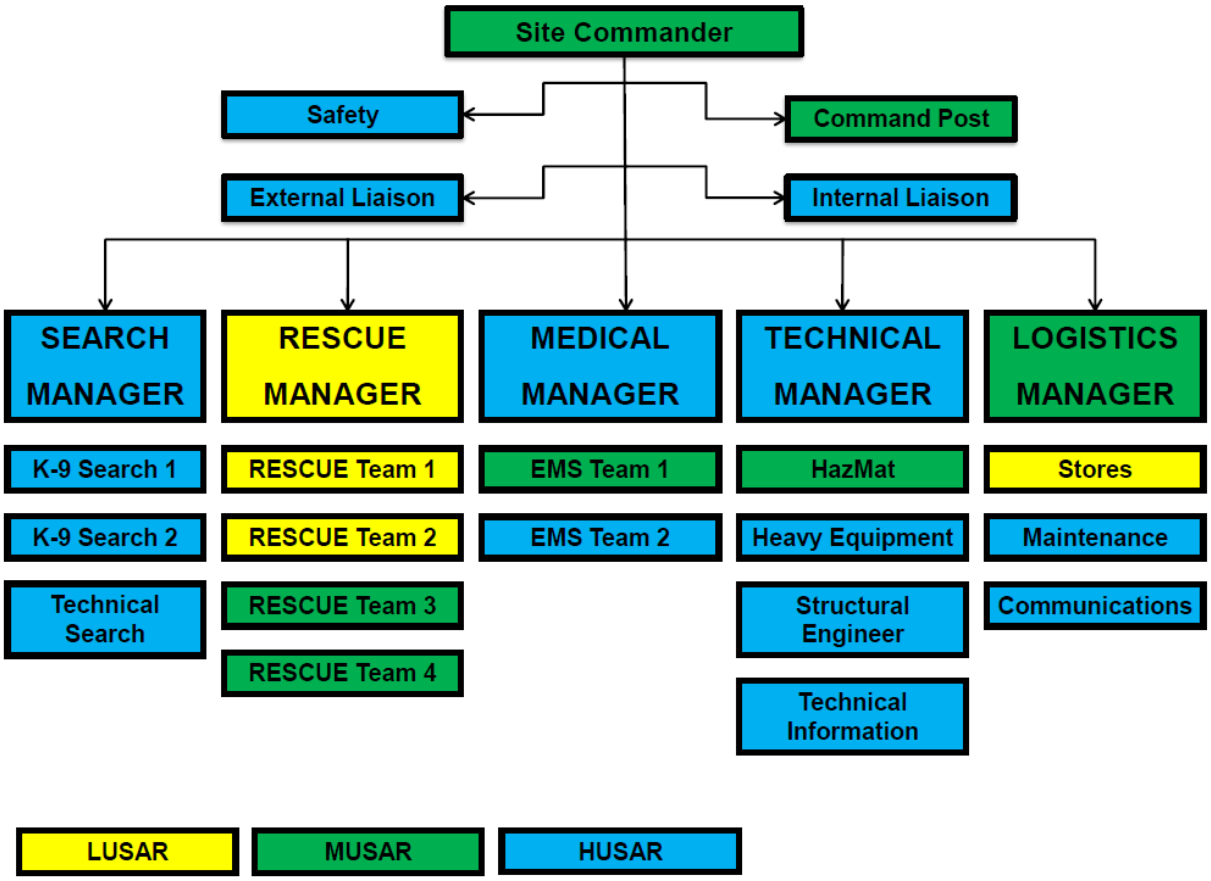
[5] National Search and Rescue Secretariat, "Quadrennial Search and Rescue Review," last accessed 07 February 2016, http://www.nss-snrs.gc.ca/en/quadrennialsarreview.page.

[6] Public Safety Canada, "Urban Search and Rescue (USAR)," last accessed 07 February 2016, http://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rspndng-mrgnc-vnts/rbn-srch-rsc-eng.aspx.

sudden-onset large scale structural collapse, in a coordinated and standardized fashion. This can occur due to natural disasters, landslides, industrial accidents and deliberate actions. The goal of USAR operations is to rescue the greatest number of trapped people in the shortest amount of time, while minimizing risk to rescuers.[7] Under Public Safety's lead, light and medium capabilities were focused in smaller centers while eight HUSAR Task Forces were proposed for major urban centers. Of the eight, only four are currently in existence based in Vancouver, Calgary, Toronto and Brandon, Manitoba. Public Safety drafted the *Canadian USAR Classification Guide* to distinguish between the capabilities available in light (LUSAR), medium (MUSAR) and heavy (HUSAR) teams. This was to assist in development and funding but also to better enable disaster-afflicted areas or countries to match team capabilities to their response needs. The United Nations International Search and Rescue Advisory Group (INSARAG) is developing an international standard to classify teams. The Public Safety classification document focuses on Canadian construction materials and building techniques but also conforms to the INSARAG classification criteria.[8] The classification guide is included as Annex A and will be used as the classification standard for recommendations in this paper. The capabilities required for each level are displayed simplistically in this chart.

[7] R.J. Busbridge, *Draft CJOC Study of CAF HUSAR Capability* (Canadian Joint Operations Command: 3000-1 (JENGR/RDIMS #394151), 19 January 2016).

[8] Public Safety Canada, "Canadian Urban Search and Rescue (USAR) Classification Guide," last accessed 07 February 2016, http://www.publicsafety.gc.ca/cnt/rsrcs/pblctns/rbn-srch-rsc/index-eng.aspx.



Existing Military USAR Capabilities

6. Since the 2010 earthquake in Haiti, the Royal Canadian Air Force (RCAF) has been developing a light USAR (LUSAR) capability housed within the Firefighter trade in the Engineer Corps. The RCAF currently has the ability to field one LUSAR team composed of two five person sections under the command of a Warrant Officer (WO) with a Master Corporal attached in a supply role. The fire halls in Comox and Trenton are responsible to force generate a section each. Comox was selected due to the elevated risk of seismic activity on the west coast while Trenton is the major CAF airhead for rapid deployment. These teams are qualified to conduct reconnaissance tasks, surface rescue, hasty search, hasty shoring and structural triage. They are equipped with cameras and listening equipment to aid in search and triage buildings

scoring them based on an assessment of probable survivability rates. The LUSAR personnel are trained on structural collapse (certified to International Fire Service Accreditation Congress (IFSAC) Structural Collapse Level II - a two week course run at the Emergency Service College). They train more frequently with FEMA than with other RCAF SAR assets. As firefighters, they already have base training in emergency medical care, rope rescue and hazardous material (HAZMAT) response satisfying a large portion of the training requirements for LUSAR outlined in Annex A.[9] This capability is not stand alone. It functions most effectively when integrated into a USAR network that includes MUSAR and HUSAR but is also dependent upon a parent organization for support (for example the engineer element in DART).

7. CONPLAN Renaissance, the CAF Contingency plan for Humanitarian Assistance and Disaster Relief (HADR) operations tasks the RCAF to be prepared to provide a twelve person LUSAR team on 48 hours' notice to move (NTM). This element is attached under the tactical command (TACOM) of the Humanitarian Operations Task Force (HOTF) Engineer Element.[10] The Royal Canadian Navy (RCN) is tasked to be prepared to provide additional forces including USAR personnel. USAR capabilities within the RCN will be discussed in the next section. The Canadian Army (CA) has no associated USAR tasks as it has no developed USAR capabilities.[11]

8. In 2000, the RCN established a MUSAR capability housed within its Pacific Naval Construction Troop (NCT) in order to increase the local ability to respond to an earthquake. The MUSAR team is composed of civilian staff, NCT personnel as a secondary duty and military and civilian volunteers. The team is led by a civilian with over 20 years' experience in USAR and disaster response. Based on the civilian-military composition, the team is a local domestic

[9] Warrant Officer Michael Patey, telephone conversation with author, 5 February 2016.
[10] J.H. Vance, *CJOC CONPLAN 20855/14 RENAISSANCE – CJOC Humanitarian Operations Contingency Plan* (CJOC Ottawa: 3120 – CONPLAN RENAISSANCE (CJOC Comd), 18 November 2014, C - 5/6.
[11] *Ibid.*, C- 3/6.

response capability and is not deployable for expeditionary operations. They have two deployable trailers of equipment including air bags for lifting operations, power and hydraulic tools, search and shoring equipment.[12] They also have numerous volunteers who, on their own initiative, have completed K9 search training with their own dogs. They have trained and developed in close contact with Vancouver's civilian HUSAR team (CAN TF-1). Additionally, they have several heavy equipment operators trained in USAR. This capability is funded entirely by the RCN. It is also responsible for HAZMAT emergencies.[13]

Proposed Mandate

9. This paper proposes that there are three primary lines of task required of a USAR capability within the CAF to address current deficiencies:

a. Shield – Protect the Force. This line of task has a domestic and expeditionary component. The capability needs to be able to mobilize quickly to conduct rescue efforts following a catastrophic incident or attack on CAF infrastructure within Canada. In expeditionary operations, the task has several components. It must be able to respond to catastrophic incidents or attacks on Canadian infrastructure on foreign soil including embassies or in-theatre bases. As a component of deployed operations, it must be able to respond to a catastrophic attack on CAF, coalition or host nation infrastructure. This is particularly import as a shield function if the force becomes engage in combat in an urban center increasing the probability of collapsed structures. Where a terrorist or insurgent threat exists, an in-theatre capability provides the ability to rescue CAF or coalitions

[12] Warrant Officer Michael Patey, telephone conversation with author, 5 February 2016.
[13] R.J. Busbridge, *Draft CJOC Study of CAF HUSAR Capability…*

soldiers but also to build trust with the population by assisting in response to attacks involving collapsed structures.

b. Aide to Civil Powers. A CAF USAR capability must be prepared to respond quickly to requests from Public Safety to assist municipal, provincial/territorial and federal emergency management efforts. This is currently the primary role for the RCN MUSAR team (in addition to support to local CAF Infrastructure).

c. Support to International HADR Operations. This line of task would provide the GOC with an additional asset to contribute as part of a response to support rescue efforts following a catastrophic attack or incident in a foreign country. This would be an expansion of the role currently provided by the RCAF LUSAR team with DART.

Capability Development

10. In order to develop a minimal capability to respond to the three lines of task above, one MUSAR team should be established in each of the Regional Joint Task Forces (RJTF). Ideally, this capability could reside within the Primary Reserve (PRes) as they are situated generally in urban centers and would provide consistency once personnel are trained as postings have less of an impact. The main challenge in developing the capability within the PRes is the ability to maintain the appropriate readiness level and NTM. A MUSAR team would require approximately 30 people to operate and be manned with at least double that number to maintain NTM. MUSAR teams would be required to match the six hour NTM maintained by the civilian HUSAR TFs with the requirement to be operational within 24 hours of a structural collapse. If the PRes are not able to meet the readiness requirements, the task should be given to a centralized formation within each RJTF, for example, a mechanized brigade group, a base or a

wing. A CJOC study found that there are no significant savings to be found in training time by leveraging existing trade specific training meaning that no trade offers significant efficiencies for generating searchers or rescuers with the exception of using trained medical technicians to meet the MUSAR medical requirements.[14] JTF Atlantic should be prioritized for capability generation as there is no civilian HUSAR TF east of Montreal.

11. Slight increases in the current DART force generation matrix and tasks would provide a deployable MUSAR capability to supplement the current LUSAR component. In addition to the two RCAF generated LUSAR sections, two additional sections and a troop or platoon headquarters element should complete USAR training providing two additional sections to be leveraged for sustained operations. Existing options to achieve economy of effort for these would be a section from the engineer field troop, defence and security (D&S) platoon or finally adding an additional 10 positions to fill the role. The three construction technicians who are already part of the DART matrix should complete the USAR training to provide additional expertise on shoring and structures. It would also be beneficial to train the designated heavy equipment operators. Equipment could be collocated with the existing DART warehouse in Trenton, ON.

12. Support to expeditionary operations could be achieved with rotating tasks through the RJTF MUSAR teams accepting risk domestically. If the threat level is relatively low, the elements that support DART could also be given the "be prepared to" task to deploy on short notice in response to a collapsed structure abroad during expeditionary operations. As the threat level increases, it may be necessary for deploying elements to force generate an internal capability. This approach was used successfully by the US Army in Iraq. US Army Reserve Engineer companies were asked to train in USAR prior to deployment. They were used to protect

[14]R.J. Busbridge, *Draft CJOC Study of CAF HUSAR Capability…*

the force but also to support host nation civilians in rescue efforts following insurgent attacks.[15] Provided standardized equipment suites were available to support force generation training, the time required to produce a functional team is manageable. Individual training timelines are outlined in Annex B. Other militaries have standing units with dedicated USAR tasks. The French Army has dedicated *Unités d'Instruction et d'Intervention de la Sécurité Civile (UIISC)* within the Engineer Corps that are trained to provide emergency response in varying circumstances domestically and abroad including USAR.[16] The Israeli military has a specialized Search and Rescue Brigade to respond to rocket attacks at home and protect the force during urban combat.[17]

13. A CJOC study found that it would be challenging for the CAF to develop a HUSAR capability. A HUSAR capability requires K9 search teams which proved difficult for the CAF to develop as a CIED tool during the Afghanistan days opting instead for a contracted solution. HUSAR also requires a structural engineer with demolition experience. 1 Engineer Support Unit estimates that it would take approximately three years of training to gain the requisite skills making it a difficult capability to develop and retain.[18] Significant value would still be obtained in creating the MUSAR + capabilities.

CONCLUSION

14. As the likelihood of conducting military operations in urban environments increases, the need to develop an urban search and rescue capability becomes more pressing. The CAF should

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[15] Adam S. Roth, "Heavy Rescue Operations During Operation Iraqi Freedom," *Engineer Magazine* (January-March 2005): 37-39. http://www.wood.army.mil/engrmag/PDFs%20for%20Jan-Mar%2005/Roth.pdf.

[16] Ministere de la Defense, "Unités d'Instruction et d'Intervention de la Sécurité Civile," last accessed 07 February 2016. http://www.defense.gouv.fr/terre/presentation/organisation-des-forces/genie/unite-d-instruction-et-d-intervention-de-la-securite-civile-n-1.

[17] Israel Defense Forces, "Search and Rescue Brigade," last modified 16 November 2014, https://www.idfblog.com/blog/2014/11/16/final-test-idf-search-rescues-war-week/.

[18] R.J. Busbridge, *Draft CJOC Study of CAF HUSAR Capability…*

move towards the development of MUSAR teams within each RJTF to protect its force at home and support domestic operations. It should increase the LUSAR capability currently included in DART to a MUSAR team and consider the option of generating and deploying USAR as part of an expeditionary force package when the threat level dictates.

Annexes:

A. Canadian USAR Classification Guide
B. Estimated Individual Training Requirements

Annex A: Canadian USAR Classification Guide

Organization

The *Canadian USAR Classification Guide* is organized in three sections: light, medium and heavy. Each section lists a summary of the key response criteria characterizing each USAR operational level. The table at the beginning of each section highlights these important attributes.

Each of the three sections lists the associated performance criteria, training requirements and equipment. For further information on training requirements, a summary list of key concepts is included in each section. Readers should note that the guide is progressive: heavy USAR operations incorporate the criteria for medium USAR which incorporates the criteria for light USAR.

Light USAR operational level						
Operational USAR level and area of response	**Time period (sustained response)**	**Victim care capacity (numbers of Persons)** **B = Black (mortality)** **R = Red (critical)** **Y = Yellow (moderate)** **G = Green (minor)**				**Structural response *(Type of construction teams are equipped and trained to search and stabilize)***
		B	**R**	**Y**	**G**	
Light: Within jurisdiction	One operational shift: (up to 12 hours)	N/A	0	5	10	• Structural wood systems • Light metal components • Un-reinforced masonry which support floors, other wall-cladding and roofing systems
Medium: Within mutual aid boundaries	One operating day (24 hours)	N/A	1-2	5	10	• All collapsed or failed structures • Includes search and rescue operations for heavy timber, reinforced masonry construction, or steel frame)
Heavy: Across Canada.	Up to 10 operating days, (Re-supplied within 3 days)	N/A	10	15	25+	• All collapsed or failed structures • Includes structural engineering and rigging for

Light USAR operational level						
Operational USAR level and area of response	**Time period (sustained response)**	**Victim care capacity (numbers of Persons)** **B = Black (mortality)** **R = Red (critical)** **Y = Yellow (moderate)** **G = Green (minor)**				**Structural response *(Type of construction teams are equipped and trained to search and stabilize)***
		B	**R**	**Y**	**G**	
						massive structural collapse

Note to "Victim care capacity"

Since the fundamental purpose of USAR teams is to locate and extricate trapped victims, immediate life support is a critical function. The column *Victim care capacity* is the notional limits that teams at each level can treat with their integral resources. A standard medical triage colour coding system is used for the reader's reference since Canadian classification of medical first responder skills can vary across jurisdictions.

It is expected that mobilized USAR teams will integrate their victim care capability with capacity resident in the system of the afflicted jurisdiction. Discussions on the mechanisms and protocols required to support the desired level of integration are ongoing.

Light USAR operational level	
Training	**Performance requirements**
Basic Urban Search and Rescue:	
Initial assessment	Recognize the risk presented by light frame structures and potential consequences
Safety procedures	Maintain and take action under relevant codes and standards for workplace occupational health and safety
Rescue equipment	Properly operate and maintain rescue equipment
Common hand tools	Properly operate and maintain hand tools
Search procedures	Apply basic visual and verbal search techniques
Basic rope rescue techniques	Single point anchor systems, knots hitches and bends, construct and operate a belay system
Patient packaging	Demonstrate proper patient immobilization techniques
Extrication	Demonstrate extrication procedures for partially buried or lightly trapped victims

Light USAR operational level	
Training	**Performance requirements**
Basic Urban Search and Rescue:	
Structural collapse theory – types of building construction and collapse/voids	Apply rescue techniques, including removal of light rubble in damaged or failed light frame structures
Emergency building shores (EBS)	Construct various applicable shoring components, apply mechanical advantage and cribbing to lift loads and stabilize collapse structures
Basic life support (BLS)	Provide BLS, patient packaging, and extrication
Hazardous materials awareness	Apply basic procedures for hazardous material incidents safety
Incident management system (IMS)	Establish an incident management system and/or join command already established. Demonstrate ability to implement IMS principles.
Relevant codes and standards for workplace occupational safety and health	Demonstrate knowledge of relevant and applicable codes and standards, e.g. CSA, COSH
INSARAG marking systems	Apply the INSARAG marking systems

Light USAR operational level training requirements

Many of the skills and knowledge requirements for light USAR are covered in *NFPA 1670: Operations and Training for Technical Rescue Incidents*.

1. Basic Urban Search and Rescue
    - Introduction to Urban Search and Rescue (USAR)
    - Risk assessment
    - Heavy lifting, cribbing, and shoring
    - Ropes and knots
    - Patient packaging and extrication
    - Ladder rescue procedures
    - Search (hailing and visual method)
    - Physical search / search patterns
    - INSARAG marking systems for structures and victim location
2. Medical first responder or equivalent
    - Emergency medical services (EMS)
    - Infectious disease precautions
    - Anatomical references
    - Initial assessment and physical exam
    - Basic life support and cardio pulmonary resuscitation (BLS and CPR)
    - Haemorrhage and shock
    - Soft-tissue injuries

- Musculoskeletal injuries
- Injuries to the skull, spine, and chest
- Burns and environmental emergencies
- Poisoning
- Medical emergencies: cardiovascular and cerebral-vascular respiratory emergencies
- Medical emergencies: seizures: diabetic, and abdominal
- Childbirth emergencies
- Moving and lifting patients
- Triage
- Protocols for oxygen therapy

3. HazMat first responder
    - HazMat incidents (awareness level *NFPA 472*)
    - Use of the Transport Canada *CANUTEC Emergency Response Guidebook* (latest Edition) or equivalent
    - Occupational safety and health
    - Workplace Hazardous Materials Information System (WHMIS)
4. Incident management system (IMS)
    - IMS principles and structure
    - Expansion and contraction of IMS structure
    - Facilities
    - Resources
    - Action plan
    - Activation, operations, and demobilization
    - Closure

Light USAR operational level equipment requirements

The following is a recommended list of tools for a light USAR team.

1. Basic manual operated and powered cutting tools, for example:
    - Circular saw
    - Chain saw
    - Chisels
    - Hack saw
    - Reciprocating saw
    - Side and bolt cutters
2. Manual breaking / breaching tools, for example:
    - Sledge hammer
    - Halligan tool
    - Pry bar
    - Cold chisel
3. Basic rope rescue equipment, for example:
    - Harness
    - Webbing
    - Prussics

    - Carabiners
    - Pulleys
4. Assortment of levers
5. Dimensional lumber
6. Handheld mobile communications equipment sufficient for SAR operations
7. Basic life support equipment
8. Personal protective equipment suitable for relevant codes and standards for workplace occupational safety and health, for example:
    - Respirators and filter cartridges
    - Steel-toed boots
    - Hard hat
    - Safety eye wear
9. Whistles and / or horns for signalling
10. Building marking supplies, for example:
    - Spray paint
    - Lumber crayons
    - Flagging tape
    - Marking pens
11. Portable rehabilitation shelter facility (complete with bottled water and food energy supplies), for example:
    - Tent
    - Military style or freeze dried food components
12. Heavy-duty bumper hitch or gooseneck hitch trailer
    - Maximum GVW of 6,750 kg (15,000 lbs.)

Medium USAR operational level						
Operational USAR level and area of response	**Time period (sustained response)**	**Victim care capacity (numbers of Persons)** **B = Black (mortality)** **R = Red (critical)** **Y = Yellow (moderate)** **G = Green (minor)**				**Structural response** ***(Type of construction teams are equipped and trained to search and stabilize)***
		B	**R**	**Y**	**G**	
Light: Within jurisdiction	One operational shift: (up to 12 hours)	N/A	0	5	10	• Structural wood systems • Light metal components • Un-reinforced masonry which support floors, other wall-cladding and roofing systems
Medium: Within	One operating	N/A	1-2	5	10	• All collapsed or failed

Medium USAR operational level						
Operational USAR level and area of response	**Time period (sustained response)**	**Victim care capacity (numbers of Persons)** **B = Black (mortality)** **R = Red (critical)** **Y = Yellow (moderate)** **G = Green (minor)**				**Structural response *(Type of construction teams are equipped and trained to search and stabilize)***
		B	**R**	**Y**	**G**	
mutual aid boundaries	day (24 hours)					structures • Includes search and rescue operations for heavy timber, reinforced masonry construction, or steel frame)
Heavy: Across Canada.	Up to 10 operating days, (Re-supplied within 3 days)	N/A	10	15	25+	• All collapsed or failed structures • Includes structural engineering and rigging for massive structural collapse

Note to "Victim care capacity"

Since the fundamental purpose of USAR teams is to locate and extricate trapped victims, immediate life support is a critical function. The column *Victim care capacity* is the notional limits that teams at each level can treat with their integral resources. A standard medical triage colour coding system is used for the reader's reference since Canadian classification of medical first responder skills can vary across jurisdictions.

It is expected that mobilized USAR teams will integrate their victim care capability with capacity resident in the system of the afflicted jurisdiction. Discussions on the mechanisms and protocols required to support the desired level of integration are ongoing.

Medium USAR operational level	
Training	**Performance criteria**
Collapsed structure search and rescue	Recognize the risks associated with all types of construction, their characteristics, collapse patterns and their potential consequences. • Apply lifting techniques for loads up to 10 metric tons, using mechanical, hydraulic, electrical, and pneumatic equipment.

Medium USAR operational level	
Training	**Performance criteria**
	• Apply stabilizing and cribbing techniques to loads and drag and roll loads (not with use of cranes). • Construct shoring systems for all construction types.
Safety officer	Demonstrate knowledge of relevant and applicable codes and standards (e.g. CSA, COSH).
HazMat operations technician level (optional)	Operate air monitoring / gas detection equipment. Apply basic procedures for hazardous material incidents safety.
CBRN awareness level	Recognition of CBRN threats.
Medical equipment and protocols	Apply medical protocols in delivery of ALS and HazMat care related to *NFPA 472*.
Confined space rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Trench rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Rope rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Vehicle and machinery rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Technical search (optional)	Apply optical, acoustic / seismic search techniques (optional).
Canine search (optional)	Control / handle USAR trained search dog (optional).
Surface water rescue (optional)	Demonstrate knowledge of surface water rescue *(NFPA 1670 / 1006).*

Medium USAR operational level training requirements

(Includes light USAR training requirements 1 through 4.)

Many of the skills and knowledge requirements listed below at 1-6 are covered in *NFPA 472: Professional Competence of Responders to Hazardous Materials Incidents, 1006: Standard for Rescue Technician Professional Qualifications,* and *1670: Operations and Training for Technical Rescue Incidents*.

1. Technical rescue (Structural collapse, confined space, trench, rope, vehicle and machinery, and surface water rescue)
    - Organizing and starting a technical rescue operation
    - Operational safety
    - Equipment, tools, and accessories

    - Rescue strategies and techniques
    - Patient packaging and extrication
2. Rescue specialist Operation of the specialized equipment and procedures necessary for completing any technical rescue operation, for example:
    - Structural triage
    - Atmospheric monitoring
    - Soil assessment
    - Constructing haul systems
    - Vehicle stabilization
    - Lock out / tag out procedures
    - Assessing water hazards
3. Emergency medical care
    - Regional procedures to provide pre-hospital medical care to critical patients
    - critical incident stress management (CISM)
    - Field health procedures
4. Safety officer
    - Risk management standards
    - Technical rescue procedures
    - Regional and national safety codes
5. Environmental assessment
    - Atmospheric monitoring equipment
    - HazMat / CBRN detection and monitoring equipment
    - Hazardous materials containment
    - Bio-hazard waste management
6. Advanced training in incident management systems (IMS)
    - IMS principles and structure
    - Personnel accountability
    - Expansion and contraction of IMS structure
    - Facilities
    - Resources
    - Action plan
    - Position descriptions
    - Unified command
    - Demobilization

Medium USAR operational level equipment requirements

The following is a recommended list of tools for a medium USAR team.

1. Hydraulic, pneumatic, and mechanical equipment for cutting plate steel or rebar up to 40 mm thick, for example:
    - Petro-Gen cutting torch
    - K-12 saw and blades
    - Electric rebar shears
2. Hydraulic, pneumatic, and mechanical equipment for breaking material up to 15 cm thick, for example:

- Air or electric jack hammers
- Hammer drills

3. Hydraulic, pneumatic, and mechanical equipment for lifting loads up to 10 metric tons, for example:
   - High or low pressure lifting bags
   - Hydraulic jacks
4. Hydraulic, pneumatic, and mechanical equipment for shoring, for example:
   - Aluminum shoring struts
   - Manufactured shoring boxes or panels
5. Equipment and accessories for raising and lowering loads, anchoring, securing, moving, and dragging loads, for example:
   - Turfer hoist
   - Chain or cable come-along
   - Cable blocks and sheaves
6. Self-contained breathing apparatus (SCBA) and replacement cylinder
   - Must conform to current NFPA rescue criteria for supplied air breathing apparatus (SABA)
7. Advanced life support equipment for at least 1 to 2 patients, including:
   - Stabilization
   - Packaging
   - Extrication
8. Equipment accessories for generating, supplying, and measuring electricity, for example:
   - Gas powered generator – maximum 7000 watts
   - Ohm meter
   - "Hot stick"
9. Air monitoring / gas detection equipment, for example:
   - 3 or 4 sensor handheld monitor
10. Asset Management System (bar code equipment programs)
11. Optical, acoustic / seismic search equipment (optional)
12. Associated canine care equipment (optional), for example:
    - Canine medical kit and pharmaceuticals
    - Dog food
    - Decontamination shower
    - Leash and anchor tie down
13. Water surface rescue personal protective equipment (optional), for example:
    - Personal floatation device
    - Water rescue helmet
    - Exposure suit
    - Throw rope

Heavy USAR operational level			
Operational USAR level and area of response	**Time period (sustained response)**	**Victim care capacity (numbers of Persons)** **B = Black**	**Structural response** ***(Type of construction teams are equipped and trained to search and stabilize)***

		(mortality) R = Red (critical) Y = Yellow (moderate) G = Green (minor)				
		B	**R**	**Y**	**G**	
Light: Within jurisdiction	One operational shift: (up to 12 hours)	N/A	0	5	10	• Structural wood systems • Light metal components • Un-reinforced masonry which support floors, other wall-cladding and roofing systems
Medium: Within mutual aid boundaries	One operating day (24 hours)	N/A	1-2	5	10	• All collapsed or failed structures • Includes search and rescue operations for heavy timber, reinforced masonry construction, or steel frame)
Heavy: Across Canada.	Up to 10 operating days, (Re-supplied within 3 days)	N/A	10	15	25+	• All collapsed or failed structures • Includes structural engineering and rigging for massive structural collapse

Note to "Victim care capacity"

Since the fundamental purpose of USAR teams is to locate and extricate trapped victims, immediate life support is a critical function. The column *Victim care capacity* is the notional limits that teams at each level can treat with their integral resources. A standard medical triage colour coding system is used for the reader's reference since Canadian classification of medical first responder skills can vary across jurisdictions.

It is expected that mobilized USAR teams will integrate their victim care capability with capacity resident in the system of the afflicted jurisdiction. Discussions on the mechanisms and protocols required to support the desired level of integration are ongoing.

Heavy USAR operational level	
Training	**Performance criteria**
Technical search	Apply optical, acoustic/seismic search techniques

Heavy USAR operational level	
Training	**Performance criteria**
Canine search	Implement USAR trained search dog procedures
Advanced cardiac life support (ACLS) and Advanced trauma life support (ATLS) medical equipment and protocols	Apply medical protocols in delivery of ACLS / ATLS care
Rigging Specialist	Apply rigging and lifting safety and operating standards
Technical information	Collect and disseminate relevant technical information
HazMat / CBRN specialist	Ability to mitigate HazMat / CBRN incident effects
Planning Specialist	Ability to develop and record operational plans
Structural Specialist	Registered professional structural engineer with demolition experience
Logistics Specialist	Ability to procure and manage equipment and supplies for team operation
Communications Specialist	Licensed to operate and ability to maintain all team communication systems
Dedicated Public Communications / liaison Specialist(s)	Ability to liaise with outside agencies and / or act as a public information officer

Heavy USAR operational level training requirements

(Includes light USAR training requirements 1 through 4 and medium USAR training requirements 1 through 6.)

Many of the skills and knowledge requirements for heavy rescue are covered in:

- ***NFPA 1670 – Operations and Training for Technical Rescue Incidents*; and**
- ***NFPA 1006 – Standard for Rescue Technician Professional Qualifications* (Operations / Technician Levels).**

HazMat skills and knowledge requirements are covered in:

- ***NFPA 472 Professional Competence of Responders to Hazardous Materials Incidents* (Operations / Technician Levels).**

1. Rigging specialist
    - Assessing the capacity and capability of construction related equipment
    - Various rigging techniques, including the development of rigging plans and procedures
2. Structural specialist – Typical work of a registered professional structural engineer, in USAR
    - Identifying structure types, assessing risks posed by structural damage
    - Designing, inspecting, and supervising structural hazard reduction interventions
    - Structural monitoring
    - Demolitions
    - Could work with assistance of a civil engineering technologist with experience in structural and demolition work
3. Technical search specialist
    - Advanced principles and theories of electronic search
    - Operation of selected technical electronic, optical, and acoustic search equipment
    - Coordinating multiple search operations
4. Canine search specialist
    - Canine search operations
    - Search pattern selection criteria, including:
        - Terrain
        - Structures
        - Weather
        - Air circulation characteristics
5. Medical specialist – Advanced care paramedic under the supervision of a Medical Director (minimum).
    - Advanced trauma / life support / advanced cardiac life support.
6. Logistics specialist – International Air Transportation Association (IATA) loadmaster.
    - Transportation of dangerous goods (road and air).
    - Asset tracking and management systems.
7. Communications specialist – Licensed amateur radio operator.
    - Equipment scheduling and maintenance procedures.
    - Planning, establishing, and maintaining all team communications systems and networks.
8. HazMat / CBRN specialist – Certified HazMat technician per *NFPA 472*.
    - Development and implementation of operational plans to mitigate HazMat / CBRN incident effects.
9. Technical information and planning specialist
    - Data management, word processing, and graphic software.
    - Technical report writing.
    - Emergency management.
10. Public information specialist
    - Media relations
    - Crisis communications
    - USAR operations

Heavy USAR operational level equipment requirements

The following is a recommended list of tools for a heavy USAR team.

1. Optical, acoustic, seismic search equipment.
    - Associated canine care equipment.
2. Appropriate advanced cardiac life support / advance trauma life support monitoring equipment and pharmaceuticals.
3. Hydraulic, pneumatic, and mechanical equipment for lifting loads up to 10 metric tons.
4. Appropriate information technology and reference materials / library and equipment.
5. Radiological monitoring, personal protective equipment and decontamination (for team requirements).
6. Appropriate equipment and office supplies.
7. Appropriate engineering tools, measuring devices, software, and reference materials.
8. Complete base camp facilities for all weather conditions including:
    - Medical treatment
    - Field kitchen
    - Sanitation / shower
    - Water storage / purification
    - Food storage
    - Cache, maintenance, and storage
    - Equipment and personnel deployment vehicles including trucks, forklifts, trailers, and ATV's.
9. Warehousing space – approximately 1,000 m^2 or 10,000 ft^2.
10. Training simulators and equipment.
11. Complete communications system including pagers, sat-com, internet, fax and operations site team communications.

Annex B: Estimated Individual Training Requirements

Common Training	LUSAR	MUSAR	HUSAR
Structural Collapse Lvl 1	1 week	1 week	1 week
Rope and Confined Space Rescue	1 week	1 week	1 week
Hazmat	2 days	1 week, 2 days	2 weeks, 2 days
Medical Responder	2 weeks	DP2 Med Tech	DP2 Med Tech plus one year Adv Care Trg or PA/MO
Structural Collapse Lvl 2	-	1 week	1 week

Additional Specialist Trg	LUSAR	MUSAR	HUSAR
Structural Specialist			3 years +
Technical Search		1 week	1 week
Rope and confined space technician (1/team)		1 week	1 week
Breach Specialist		1 week	
Shoring specialist		2 weeks	

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